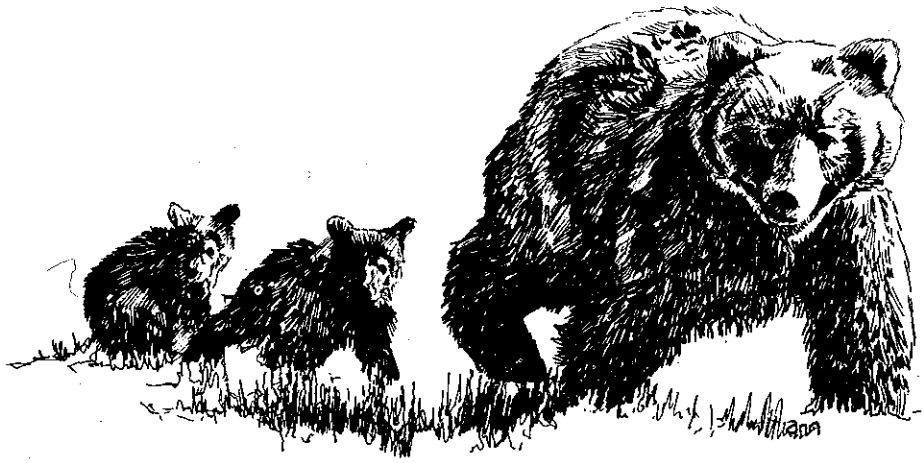


Four

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter explains the environmental consequences of the four alternatives, including the Proposed Action, discussed in Chapter 2. Environmental aspects are analyzed to determine the potential impact of each alternative. Climate and Geology and Topography were not analyzed further since these components would not be significantly affected by any of the alternatives.

The High Level and Proposed Action Alternatives include the disposal of lands or tracts in the Land Tenure Adjustment Area and entail a loss of Bureau of Land Management (BLM) management of those disposal lands. Application of the planning criteria (see Appendix 1.3, issues 7 and 8) has eliminated individual tracts with significant resource values or potentials for BLM resource management. Whether or not disposing of these tracts would result in actual losses of existing values, such as wildlife habitat, cannot be estimated at this time. However, since many of the tracts are suited only for the existing land uses, there may not be a significant change in any individual resource. The public use of disposed of lands would be lost as far as the BLM is concerned.

The remaining public lands in the Billings Resource Area (outside the Land Tenure Adjustment Area) will be evaluated by applying the criteria defined in the Land Pattern Review and Adjustment Project Management Plan.

This chapter quantifies the specific impacts (where possible), discusses where the impacts would likely occur, how much of the environmental component would be affected, and what the significance of the impact would be. The impact discussions relate primarily to public lands and those actions or proposals which impact specific resources in this chapter.

Chapter 4 is divided into three sections: Assumptions made for analyzing impacts, General Impacts and Impacts by Alternative.

Each alternative is analyzed as if it were fully implemented, fully funded, and fully staffed. For the purpose of analyzing the impacts of implementing each alternative, the following assumptions were made:

ASSUMPTIONS

Grazing Management

1. Chemical treatments would only be considered on noxious weeds; primarily leafy spurge.

2. Burning would be the only treatment considered for sagebrush.

3. The resource management plan (RMP) would be followed by activity planning. There would be a benefit/cost analysis completed for all proposals and all affected parties would be consulted.

Wildlife

4. All sagebrush tracts to be burned will be small and spread over a wide geographic area. Burn sites will be designated jointly by BLM and the Montana Department of Fish, Wildlife and Parks.

5. No sagebrush burning will be allowed in crucial habitats for antelope, sage grouse and chukar partridge.

6. All sagebrush burning will be conducted in conformance with the Montana Cooperative Smoke Management Plan.

7. All new allotment management plans will be developed cooperatively between the range/wildlife staffs and will include wildlife habitat management objectives.

8. All newly constructed water sources will be designed to facilitate use by wildlife.

9. All newly constructed range fences will be done in conformance with BLM Manual 1737 standards.

10. Wildlife ramps will be installed in all new stock-watering tanks to facilitate use by nongame species.

11. No oil and gas exploration/development will be allowed during crucial mating and nesting periods for upland game birds in high concentration areas (March 1 to June 30).

12. Federal coal unsuitability criteria 9 through 15 will be completely applied prior to any leasing of Federal coal reserves.

13. No action affecting public lands will be allowed which would adversely affect habitats for state or Federally listed threatened or endangered species.

14. Management actions within floodplains and wetlands will include measures to preserve, protect, and if necessary, restore their natural functions (as required by Executive Orders 11988 and 11990).

15. Informal and formal consultation with the U.S. Fish and Wildlife Service will be carried out pursuant to Section 7 of the Endangered Species Act of 1973, as amended.

16. A biological assessment to identify any proposals which may affect threatened or endangered species will be completed prior to issuance of a Record of Decision for this EIS.

17. Prior to the disposal of any lands, an intensive wildlife evaluation will be completed and the Montana Department of Fish, Wildlife and Parks will be requested to offer a biological assessment of the area.

18. No ground disturbing activity will be allowed until a multi-disciplinary environmental assessment is completed.

Land Tenure Adjustment

19. Minerals ownership would normally be retained by the Federal Government. If exchanges of Federal/non-Federal minerals are found to be in the best public interest, such exchanges may occur.

Exchanges or exchange pooling may be made to acquire or exchange similar or dissimilar types of resources or land values dependent on identified need, guidance or objectives. Likewise, exchanges may be confined to relatively small areas or broader regions.

Cultural Resources

20. An appropriate level of inventory to identify historic and prehistoric sites or features would be conducted in areas proposed for any Bureau initiated or authorized surface disturbing projects (i.e., range improvements, coal leasing), land sales, exchanges or exchange pooling. Sites discovered would be evaluated using criteria for placement on the National Register of Historic Places (36 CFR 60.6) in consultation with the State Historic Preservation Officer. The BLM would consider the effect of any proposed undertaking on sites which meet the National Register criteria by following regulations of the Advisory Council on Historic Preservation (36 CFR 800) or memoranda of agreement negotiated with the Council.

In most cases, adverse effects to National Register quality sites would be avoided by relocating ground disturbing activities. Where moving an undertaking is not feasible, mitigation of adverse effects to significant cultural properties may be necessary. Mitigation would usually be an attempt to extract and preserve those attributes of a site which qualify it for the National Register. For example, many prehistoric sites are significant for the information they may provide about ancient Indian lifeways and cultural adaptations. Various levels of site recording, excavation, and analysis can often retrieve the important information, preserving it in records and reports.

Sites with socio-cultural values or aesthetic and recreational values amenable to public interpretation may be more difficult to mitigate by data recovery. Decisions about the treatment of such sites would be made on a case-by-case basis in consultation with the State Historic Preservation Officer and Advisory Council on Historic Preservation (see Appendix 1.10).

Coal

21. For analysis purposes, two new coal mines are projected and evaluated. This includes a 300,000 ton per year surface mine in the Bull Mountain field, and a 150,000 ton per year underground operation in the Joliet-Fromberg Field.

22. The 20 unsuitability criteria would be completely applied before any area could be considered in a final lease sale EIS.

23. Federal coal in the three fields in Carbon County would be developable only by underground mining methods.

24. If mining occurs, the lessee will comply with existing state and Federal regulations governing mining and reclamation. These include: Office of Surface Mining Reclamation and Enforcement regulations (30 CFR 700-899). Environmental Protection Agency regulations (40 CFR 0-1399), Council for Environmental Quality regulations (40 CFR 211), the Department of the Interior's Coal Management Program regulations (43 CFR 23 and 3400) and regulations promulgated under the Montana Strip and Underground Mine Reclamation Act, and the Montana Environmental Policy Act.

Oil and Gas Leasing

25. Oil and gas drill sites would average approximately 2 acres in size.

Visual Resources

26. Mitigation of impacts to visual resources would be developed for all actions causing surface disturbance.

Wilderness

27. In the short term, under the Continuation of Existing Management Alternative, other resource uses would be constrained by the Wilderness Interim Management Policy. In the long term, it's assumed that no wilderness designations would be made under this alternative.

METHODOLOGY SECTION

The methods to be used for the installation of range improvements for the benefit of grazing management (cattle, horses and sheep), wild horses and wildlife are discussed in the Methodology Section of the Appendix. In addition, please refer to these appendix items for methods used in discussing ranch related impacts and the program implementation of the timber, off-road vehicle, cultural and visual management programs:

4.1—Methodology for Grazing Management

4.2—Methodology For Rating Grazing Management Response

4.3—Methodology For Wild Horse Management

4.4—Methodology For Wildlife Management Program

4.5—Methodology Of Timber Management

4.6—Methodology Used To Determine Impacts to Visual Resources

4.7—Management of Cultural Resources

4.8—Economic And Social Impact Assessment

4.9—Methodology for Controlled Burns

GENERAL IMPACTS

The impacts described in this section generally apply to all alternatives and are discussed separately.

Irretrievable and irreversible commitments of human resources, materials, fossil fuels and money would be made in all of the alternatives. The level of this commitment would vary among alternatives and within an alternative based on the level of implementation achieved.

Air Quality

Grazing Management and Wild Horse Management

Most of the soils in this resource area have moderate to severe wind erosion susceptibilities. In areas where vegetative cover is lacking and the range is in poor to fair condition, wind erosion can be severe. Once eroded by wind, the soil particles become airborne, and cause air quality to deteriorate. Spraying of noxious weeds can cause short-term localized impacts to air quality, in the treatment areas.

Coal and Oil and Gas Leasing

Surface disturbing activities may adversely impact the air quality locally through the production of dust. The use of internal combustion engines in heavy equipment and vehicles will emit chemical pollutants to the air, and cause short-term impacts.

Minerals

Off-road Vehicle (ORV) Use

Existing or proposed ORV designations would permit authorized mineral exploration.

Wilderness

The present status of the four wilderness study areas and units constrains mineral exploration and development, since these activities may not degrade wilderness values. Oil and gas exploration opportunities may also be restricted by these non-impairment provisions.

After December 31, 1983, designated wilderness areas will be closed to mineral entry. However, development work, extraction and patenting would be allowed to continue on valid claims located on or before that date. Valid claims located after Congressional designation could be patented for the mineral estate only. It is uncertain whether oil and gas leases would be issued in designated wilderness. After December 31, 1983, all wilderness areas will be closed to new mineral leasing. If not leased, oil and gas reserves would not be removed, resulting in an undetermined economic loss.

Soils/Watershed (Erosion and Runoff)

Impacts to erosion and runoff by the Bureau of Land Management's actions were analyzed using the existing soil group susceptibilities, the surface water runoff potential and the averaged annual yield in acre-feet/acre. It has been assumed that the changes in water quality are proportional to the changes in erosion and runoff.

Grazing Management

The proper management of livestock grazing is necessary to maintain the production of desirable rangeland vegetation (Hormay, 1975). Concentrations of livestock led to the overuse of vegetation and soil compaction in areas such as floodplains and around reservoirs (Rauzi and Hanson, 1966; Gifford, 1975; Holechek, 1980; and Smeins, 1975). The removal of vegetation and soil compaction by livestock decreases water infiltration and increases both sediment and water yields (Rauzi and Hanson, 1966 and Holechek, 1980).

Additional range facilities would improve livestock distribution for more uniform forage use. Livestock would still concentrate, especially in floodplain and riparian zones, but a greater number of range facilities would dissipate the overall effect to include upland areas and allow watershed conditions to stabilize or improve (Vallentine, 1971). Installation of range improvements would cause soil losses during the construction phases, but this is a short-term effect and would be mitigated by improving the distribution of livestock.

Mechanical treatments and sagebrush burning expose large areas of bare soil to erosion initially, but greater vegetation cover after the first year lowers runoff and erosion. Range vegetation production can be increased by mechanical treatments of native or introduced plant species (Environmental Protection Agency, 1979 and Branson, et al., 1962). Soil losses from planned sagebrush burning can be stopped almost completely by the end of the first spring season (Pechanec, et al., 1954).

Wild Horse Management

The proper management of wild horse populations benefits watershed conditions just as proper livestock management does. However, watershed conditions would improve slowly due to the fragile nature of the Pryor Mountain Wild Horse Range. The soils in the Pryor Mountain Wild Horse Range are those described by Geomorphic Soil Group FOUR.

Timber Management

Logging would cause increases in surface runoff and erosion (Moring and Lantz, 1975). The primary causes of accelerated erosion are logging trails and skid areas (Hewlett and Nutter, 1969). Timber harvesting methods strongly affect the impacts to the watershed. The proposed timber management in all the alternatives would occur on Soil Groups FOUR and ONE.

Coal

Vegetative disturbances associated with surface coal mining increase the possibility of erosion and stream sedimentation (DHES, 1982). Required use of sedimentation ponds and other sediment control measures specified in state and Federal mining regulations prevent significant impacts caused by erosion (USGS and DSL, 1979). The quality of water from mined lands during mining and from reclaimed lands after mining would be equal to or better than quality prior to mining unless difficulties occur in revegetation or with subsidence. Timely occurrence of most precipitation during the growing season makes mineland reclamation normally possible (Bureau of Reclamation, 1982). It is assumed that reclamation would be successful. Runoff volume could be reduced during mining due to pit interception but could be increased following reclamation from reduced infiltration. These effects would be short-term and insignificant being mitigated by eventual root penetration and interception by numerous reservoirs, spreader dikes and other diversions that typically control flow on these stream channels (Dollhopf, 1979 and Bureau of Reclamation, 1982).

Oil and Gas Leasing

Oil and gas exploration and operations would create increases in erosion due to surface disturbances, compaction by traffic and the possible loss of vegetation from oil and drilling fluid spills. The Lewistown Oil and Gas Programmatic Environmental Assessment requires mitigation of the impacts to watershed by setting environmental stipulations for leasing and describing measures to reduce or eliminate the vegetative impacts from oil and gas operations.

Classifications

Lifting the Classification and Multiple Use Act of 1964 (C&MU) classifications in the Pryor Mountains could result in some increased mining activity and degradation of the soil and watershed resources.

Off-road Vehicle Use

The ORV closures and limited use designations protect the watershed by decreasing use and maintaining soil stability. Off-road vehicle use outside of restricted areas results in relatively small areas of compacted soil, increased runoff and increased erosion. Opening large areas of public land to ORV use would result in significant impacts to the soils and watershed.

Soils/Watershed (Water Quality and Streambank Protection)

When erosion and runoff are accelerated on a watershed, water quality is reduced because concentrations of suspended sediment, nutrients, total dissolved solids and fecal bacteria in surface waters are increased (EPA, 1979; Holechek, 1980; Smeins, 1975; and Johnson, Gary, and Ponce, 1978). Increased woody floodplain vegetation cover would help stabilize streambanks and channels, by resisting erosion, slowing the water velocity, improving water quality by reducing suspended sediment and fecal bacteria and lowering water temperatures by providing shade (Holecheck, 1980).

Occasional discharge of mine area water could also have short-term insignificant impacts. Quality of this water would depend on quality of water entering the pits and on any contamination caused by mining operations. Occasionally, mine effluent might have an increased concentration of nitrate as a result of blasting materials used in the mine (Cannon, 1982).

Grazing and Wild Horse Management

Grazing systems that provide periodic rest or deferment result in improved water quality, less soil compaction and streambank sloughing (Holechek, 1980). Due to increased soil losses from the construction of range facilities for livestock and wild horses, short-term water quality impacts are possible. These impacts include increases in suspended sediment concentrations, turbidity, total dissolved solids and channel erosion.

Timber Management

Small scale timber harvesting would produce short-term impacts to local streams as discussed in the Timber Management section of the Erosion and Runoff discussion.

Soils / Watershed (Groundwater)

Coal

Bull Mountain residents rely heavily upon springs and shallow wells to furnish water for stock and domestic uses. Geologic formations associated with coal mining also serve as important groundwater aquifers for these local uses. As the coal is removed, groundwater flow is interrupted and modified. Springs, seeps, and shallow wells in mining areas often dry up and the groundwater supply to local streams is reduced during mining (DHES, 1982). Low permeability of aquifers in this area would probably restrict these effects to within approximately 1 mile of the mine.

Mine spoils left to replace a mined-out coal bed alter the groundwater resource further. Hydraulic conductivities of mine spoils have been found to be similar to those of coal beds they have replaced (VanVoast, 1982). This suggests that water sources eliminated by mining may be reestablished in time following reclamation. The magnitude of post-mining impacts on groundwater quality is highly variable and difficult to predict, being dependent upon several variables (VanVoast and Hedges, 1977). Dissolved-solids (TDS) contents in spoils water, for example, at the Rosebud, Big Sky and Decker mines are 64%, 100% and 39% higher respectively, than concentrations in nearby stock and domestic supplies (VanVoast, 1982). Recent research also points out that higher TDS concentrations found in spoils waters do not necessarily preclude the useability of the waters for stock or domestic supplies. Their average values are within the range of dissolved-solids in groundwaters currently being used and their diversity is such that many of them are highly acceptable for use. Some of them, at the higher end of the dissolved-solids range, would be unacceptable (VanVoast, 1982). The solution rate in the spoils tends to decrease as water moves through it. However, it may take centuries before groundwater quality approaches pre-mine conditions. Increases in groundwater discharge salinity can produce a significant deterioration of surface water quality in streams being fed by groundwater during low flows (Moran, 1979). Replacement sources of groundwater must be obtainable before existing sources can be jeopardized by mining. The responsible mining company must bear the expense to replace water sources that have been altered sufficiently to preclude current usage (DSL, 1980).

Regional groundwater impacts from coal mining have been studied using the Tongue River as an indicator, since it is the natural recipient of groundwater discharging from coal mine areas. Hydrologic studies have shown repeatedly that no single mine can cause substantial adverse changes in the Tongue River's quality or rate of flow (VanVoast and Thompson, 1982). Groundwater discharges modeled from nine mines upstream of the Tongue River Reservoir were shown to have insignificant effects on Tongue River water quality. Coal has been mined in the region of this study for years. Most operations in the past were small and underground and have had little noticeable effect on the land or water (VanVoast and Thompson, 1982).

Coal mining could have short-term localized significant impacts on water quantity and quality, impacts that must be mitigable to be in compliance with state and Federal mining laws. Localized groundwater quality could be irreversibly altered, but changes must be within limits that allow current uses or the water must be replaceable by other sources. Regional and long-term impacts would be insignificant unless allowed to become cumulative to the point that downgradient users would also need replacement sources.

Impacts on groundwater quantity and quality would occur under all alternative courses of action. Magnitude of the impacts would be related to the degree of mining.

Coal and Oil and Gas Leasing

Underground coal mining would have a much smaller impact on nearby streams. Increases in the turbidity of water could result from any stage of oil and gas development. Adverse impacts to water quality are possible during periods of high runoff by well site contaminants or spillage. The severity of the impacts would be proportional to the number of installations in an area and their proximity to streams and to the downstream water uses. True alluvial soils on alluvial valley floors would be protected from surface mining through coal unsuitability Criterion #19 (see Appendix 1.4).

Recreation Access

Public access to rivers and streams would cause some streambank stability problems, and associated deterioration of water quality. The BLM administers 30 miles of various perennial streams in the resource area.

Wilderness

Wilderness designation would cause no major impacts to soils and watershed. Erosion on vehicle ways would gradually decrease. The erosion associated with livestock grazing would continue. Since no projects to improve soils or watersheds are proposed in any of the study units or areas, no benefits would be foregone with wilderness designation. If none of the areas were designated as wilderness, there would be some potential for erosion and/or watershed damage, particularly from mineral development or timber harvest.

Vegetation

Proper use stocking, allocating half the annual forage production to consumptive use by livestock and wildlife, helps to ensure a sustained yield and improved range vegetation. Proper use allows the maintenance of plant food reserves, resists invasion of undesirable and unproductive plants and allows for the increase of desirable plants and groundwater supplies by improving ground cover and infiltration (Dyksterhuis, 1951). Proper consumption of the major forage plants is 50-55% (Lodge and Campbell, 1965) though some browse species can be used up to 60% (BLM Manual 4400). Heavier utilization (up to 80%) of crested wheatgrass is recommended on a periodic basis to maximize productivity (Lodge, Smoliak and Johnson, 1972). Light use (21-40%) is generally more conducive to range improvement than moderate use (41-60%) (Johnson and Smoliak, 1979).

Heavy grazing stops root growth and since 30% of all root material must be replaced annually, this eventually reduces the root volume. Plant vigor diminishes with a reduction in root volume and the plant cannot compete with undesirable plants that fill the open spaces left by dead roots and smaller plants. The end result is a deterioration in range condition.

Hormay (1970) pointed out that it's unrealistic to assume that plants can be grazed at proper use levels through regulation of stocking because livestock graze selectively both by plant species and by areas. This results in overuse of preferred plants and accessible areas, especially floodplains and riparian zones. Selective grazing, constant stocking levels and the wide variability in annual production result in severe use of riparian zones and other areas near water in dry years. Thus, proper use allocations must be combined with proper grazing management to ensure maintenance or improvement of vegetation over an entire allotment.

Cook (1966) found that grazing range plants during any part of the growth period reduces plant carbohydrate reserves which periodic deferment can restore. It is recognized that excessive use during flowering time is the most damaging (Hormay, 1970). As much as 75% of plant's winter-stored carbohydrates are required to initiate the first 10% of growth (Hormay, 1970).

The deferment necessary to restore carbohydrate reserves can be provided by grazing systems that rotate use during the growth period, developing early spring pastures to defer the use of native range, proper use grazing and proper seasons-of-use. If the ecological range condition is unsatisfactory, improvement can also be made by a grazing system that provides for the physiological requirements of plants. This grazing system must periodically defer use until after seed ripening of key forage species.

In a study of various management systems on BLM allotments in the Missouri Breaks EIS area, Willard and Herman (1978) found that rest rotation was better than continuous season long grazing but not as effective as winter grazing in improving water infiltration, allowing for better vigor of key species and for more litter and increasing the production of desirable grasses. No conclusions were made about the use of deferred rotation in this study because of the limited sample.

Winter grazing is the most favorable grazing treatment because all grazing takes place when plants are dormant. Plant carbohydrate reserves are least depleted during the dormant period. Vigorous plants and excellent litter cover result from winter grazing, conducive to high water infiltration. Infiltration rates are also improved because soil compaction caused by livestock occurs only during periodic thaws. Willard and Herman (1978) found that winter use improved vegetation more than any other grazing system.

Soil characteristics and current range condition are the determining factors in estimating response to grazing management. The estimated response to various soils shown in Appendix 3.3 was developed from observations and monitoring of similar soils under grazing management systems. Some sites would not improve significantly in response to grazing management systems due to soil factors such as dense clay, gravels, claypans, etc., or areas with a dense canopy of sagebrush or pure stands of blue gramma.

As a result of increases in desirable plants, range conditions would improve to high, good or excellent in 5-10 years after mechanical treatments. Based on available literature (Ryerson, et al., 1970; Ryerson, Taylor, and Houlton, 1974; Houlton, 1975; Ryerson and Houlton, 1979; and Ryerson, Houlton and Wambolt, 1980), observations of treated areas and professional judgment, it is estimated that 75% of any mechanically treated acreage would reach excellent ecological range condition while the remainder would reach good condition. Average production increases are 200-250%. This increase is used in projecting the increase in forage production expressed in animal unit months (AUMs) due to mechanical treatments.

Treatments of crested wheatgrass combined with fencing into separate pastures are effective in changing the relative unpalatability of rank crested wheatgrass areas. Yields can be doubled by interseeding 1 pound of alfalfa per acre (Lodge, Smoliak and Johnson, 1972) and sustained. Lodge, Smoliak and Johnson (1972) found that crested wheatgrass in combination with the native range yields far greater returns in forage production than native range alone. They found that the most effective grazing system was to graze crested wheatgrass May through mid-June with the native range and crested wheatgrass grazed "free choice" thereafter. The native range improved significantly after seven years with this system.

Prescribed burning of dense (25% canopy) big sagebrush will greatly reduce canopy of sagebrush. Grass cover will increase, resulting in at least a doubling of forage production (Ralphs and Busby, 1978; Pechanec, 1954). The longevity of the effects will depend on the management applied and moisture patterns. Variations in fuel type and density, terrain features, weather and method of ignition will affect the actual amount of area burned (Smith and Busby, 1981). In this analysis, it is assumed that 40% of the area would be unburned.

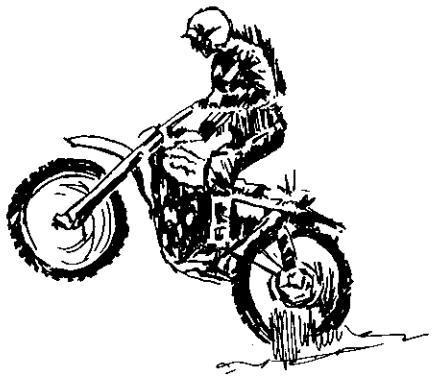
Grazing systems based on the physiological requirements of the key plants would ensure the maintenance or improvement of mechanically treated and burned areas in the long term (Ryerson 1970).

Range facilities contribute to improved range condition and production by improving livestock distribution and allowing for rest and deferment of pastures or rest of riparian zones. Fences control livestock movement while water sources, salt and minerals (when placed in the proper location) improve vegetation by better distributing livestock (Vallentine, 1971). Vegetation can be adversely affected where improperly located fences cause livestock concentrations, trailing and overuse (Vallentine, 1971).

Leafy spurge and other noxious weeds can outcompete desirable forage plants and reduce forage by 75% (Leafy Spurge Symposium, 1979). Control is very difficult but can be accomplished over several years. Proper applications of 2,4D and Tordon do not harm grass species which increase in response to weed control.

Off-road Vehicle Use

Off-road vehicle closures and limited use designations protect the vegetation by decreasing use and maintaining soil stability.



Livestock

Studies have shown that per-acre livestock returns are higher under proper use grazing levels than under heavy use. Higher production per cow unit would offset the fewer cows being grazed under proper use (Houston and Woodward, 1966).

In some instances, rotational grazing treatments would increase livestock stress and reduce productivity. Smoliak (1960) found that yearling gains were higher under continuous grazing than under deferred rotation in a southeastern Alberta study. However, where the ecological range condition is poor or fair and the pasture overgrazed, livestock productivity would be low but would improve as forage condition improved (Smoliak, 1960 and Johnson and Smoliak, 1979). Where livestock productivity is high and forage conditions are generally good, rotational grazing would reduce gain per-animal although total production would be increased due to more livestock numbers (Smoliak, 1960).

The manner in which the livestock are handled and the time allowed for pasture moves are important in animal stress (Johnson and Smoliak, 1979). Where grazing systems have a minimum number of pastures to accomplish the desired improvement in vegetation and result in substantial increase in livestock AUMs, there would be no net negative impacts (Johnson and Smoliak, 1979).

Livestock would benefit from rest rotation systems, too, particularly in these systems where the rested pasture is used first the following spring. In the rested pasture the brood cows would be provided a reliable supply of nutritious forage at a critical time and the previous year's growth would provide shelter for young calves. In addition, the presence of old growth vegetation can help reduce scours and grass tetany which are both aggravated by an abundance of green grass.

Grazing systems which require fencing large allotments into pastures would also improve calf crops by improving breeding success. The cows would be concentrated and more available to the bulls (Johnson and Smoliak, 1979).

Where rest rotation systems were not applied, livestock production would be reduced for 1½-2 years on burned or mechanically treated allotments to allow for deferment of the treatment area.

Crested wheatgrass on early spring pasture provides nutritious forage 3 weeks earlier than native range (Wildon, Thomas and Jacobson, 1971). The per-acre gains would be increased by about 50% where crested wheatgrass would be used as spring pasture (Johnson and Smoliak, 1979). A danger of bloat exists if alfalfa is interseeded with treatments but no loss with this practice has been reported to date (Ryerson, 1980, Personal Communication).

The forage increase from mechanical treatments with the higher protein content of forage would result in doubling or tripling the per-acre gains and maintenance of individual animal gains.

Vallentine (1971) recommended that water supplies be placed so cattle would not have to trail more than 1 mile to water and Mackie (1970) reported almost no livestock use of water at distances greater than 1 mile. Proper placement of water sources would contribute to increased livestock productivity.

Wild Horses

Wild Horse Management

Controlling the available water sources would result in better horse and grazing distribution. However, this would also be a minor infringement on the wild and free roaming behavior of the animals.

Overall production of foals for the wild horse herd now averages approximately 25% of the total population. This means that about 30 head of horses need to be excessed annually at an average removal cost of $692 (120 adult horses X 25% reproduction rate).

The herd's sex and age distribution has a direct bearing on the reproduction capacity and rate of the animals. The higher number of breeding age females in a herd, the higher the reproduction rate. Allowing older horses to die naturally, in lieu of excessing, would reduce the reproduction capacity and rate within the population. This in turn would reduce overall population reproduction and reduce the number of animals requiring excessing each year.

Boundary fencing would have no impact on horse movement within the range. However, interior fence projects would impact the free roaming status of the wild horse population.

Timber Management

Timber management activities would disrupt wild horse movement in the short term. Any reduction in forest canopy, through timber harvesting, would increase forage production in the long term and would increase the carrying capacity of the range.

Classification

Removing the existing classifications on the horse range may increase minerals exploration and development activities. This would disrupt the wild and free roaming character of the horses, change the horses' social structure and lower the reproduction rate.

Wild Horse Interpretation

Development of a wild horse interpretive area would adversely impact horse behavior in the short term. Such a disruption would cause the horses to concentrate in areas with minimal human activity and cause excessive forage consumption in those areas.

Wildlife (Terrestrial)

Grazing Management

Grazing treatments which provide spring rest or deferment improve the quality and quantity of big game forage (Mackie, 1970; Knowles, 1975; and Komberec, 1976). Rest or deferment grazing treatments would make forage (especially forbs) more available to big game species in the spring. In the long term, periodic spring deferment would make succulent green forbs and grasses available to deer, antelope and elk; improving the physical condition of the females during gestation and lactation (Verme, 1969).

Upland game birds require the residual or "carry over" vegetation, provided in areas of light or no grazing, for nesting and winter survival. Through the use of grazing systems or treatments to provide greater distribution of cattle, residual cover in the current low and no use areas would be decreased. However, this would allow for greater vegetative production in the current high use and concentration areas to help offset the loss.

Additional residual vegetation from greater vegetative production due to the use of grazing systems and land treatments would help satisfy the needs of upland nesting waterfowl. Adequate residual vegetation for nesting and brood rearing would be available where there is dense cover, i.e., near reservoirs in rested and deferred pastures (Berg, 1956; and Johnson, et al., 1978).

The quality and quantity of nongame forage and cover would likely increase as a result of the implementation of coordinated grazing management systems. This would be reflected in an improvement in the abundance and diversity of nongame species.

Vegetative manipulation would alter the wildlife population density and diversity in the treated areas. Large mammals would be displaced temporarily, but should benefit within 2-3 years from increased succulent forb and grass production in the spring. Some non-crucial antelope winter habitat and upland game bird nesting habitat may be lost in the short term. The increased spring forb and succulent grass production would be beneficial to many game and nongame species during the spring and summer months. Nongame species would be temporarily displaced, but the increased vegetative diversity is likely to enhance wildlife species diversity and abundance in the long term.

The construction of structural developments such as reservoirs, water catchments, wells and fences would displace wildlife species temporarily due to habitat disruption and increased human activity. Providing additional watering sources through the coordinated management plan approach should prove to be valuable to wildlife populations and habitat. However, water developments can be quite detrimental, particularly to mule deer and sharptail grouse when they occur in coulees near the terminal portions of larger ridges or near smaller ridges where the area available for cattle dispersal on primary range types is limited (Mackie, 1970). Fences would be constructed in a manner to minimize movement barriers to big game, by utilizing standards outlined in BLM Manual 1737.

Wild Horse Management

Observations by BLM personnel indicate minimal social conflicts between big game species and wild horses.

Keeping wild horse populations in balance with available forage would allow the range conditions to improve. This improved vegetative condition would provide increased forage for big game and a greater diversity of vegetative composition which would expand and diversify nongame species.

Water availability is a major influence in the distribution of wildlife on the horse range. The addition of new watering sources would expand the available habitat for mule deer, bighorn sheep and numerous nongame species.

Additional fences within the horse range could cause minor adverse impacts to the movement of mule deer and bighorn sheep.

Wildlife

Not all actions or improvements proposed would benefit all species of wildlife. The proposals have been made to benefit selected species and their habitats which display the potential for development or habitat enhancement. There would be a short-term movement of wildlife species to other areas during the physical development of the proposed facilities due to the social intolerance of humans and wildlife. Additionally, small amounts of habitat would be disturbed or destroyed as projects are installed.

Timber

During logging activity, wildlife would move to other areas to avoid the increased human activity and harassment. Some big game escape cover would be lost in the short term. The areas where logging activities are proposed support very dense stands of timber, much of which has become infested with pine bark beetles. Harvested areas will be designed in such a way as to minimize adverse impacts to resident wildlife. Old snag trees will be left in an effort to continue providing habitat for cavity nesting nongame species. The harvest projects proposed will create numerous small openings in the canopy which will greatly increase the "edge" effect of the area. This will provide increased forage availability for turkeys, mountain grouse and numerous big game species while still providing escape cover.

Coal

No impacts to the wildlife resource would be realized in the short term. As mining activity was initiated, habitats for resident species of wildlife would be disturbed or destroyed by the construction of support facilities. Habitat destruction could decrease the population levels of some resident wildlife species. This would also cause the movement of wildlife to areas of less disturbance. Additionally, with the projected peak production level in the long term, approximately 21 acres annually could be disturbed or destroyed. This could affect a total of 365 acres during the life of this plan (25 years).

It is anticipated that total restoration of the disturbed habitat occurring in the ponderosa pine vegetative type would not be accomplished during the life of this plan. Studies are currently underway at active mines in the Sarpy Creek (southcentral Montana) area to monitor success and rate of response of this vegetative type.

Oil and Gas Leasing

The construction of access roads and drill pad sites would cause a short-term loss of habitat. During the drilling process, the physical presence of machinery and associated activities would cause the movement of wildlife from the area. However, most potential impacts are mitigated with standard stipulations attached to the application to drill permit.

Land Tenure Adjustment

The sale of public lands could mean the loss of BLM control of some wildlife habitat. The program also offers the potential for the exchange of lands having equal or greater wildlife habitat values that would benefit from public ownership.

Classifications

Classifications restricting mineral entry protect habitat from surface disturbing activities. If the restrictions imposed by classifications are lifted and mineral exploration occurs, wildlife habitats would be destroyed through the development of facilities and access roads. Wildlife species in the area would also move to other areas during development due to the levels of harassment.

Recreation Access

Increases in recreational access can cause a gradual decline in habitat condition of those areas utilized. Movement of wildlife species from the area would also occur due to social intolerance of the human activities.

Off-road Vehicle Use

Off-road vehicle use causes the destruction of habitat for some resident species of wildlife. Additionally, the increased activity and presence of humans would cause a short-term movement of species from the area due to social intolerance.

Environmental Education

The physical presence of humans and associated activities would cause a short-term movement of wildlife species from the area.

Wilderness

Designation of an area as wilderness ensures the long-term protection of the current terrestrial and aquatic habitats, and other resource values, from disturbance or destruction caused by such things as mineral development, timber harvest and project construction. From the standpoint of wildlife habitat preservation, wilderness designation is beneficial. However, the designation of an area could also affect the ability of managers to manipulate habitats or construct new facilities which could enhance habitat or make additional habitat available.

If the study areas are not designated as wilderness, there is a long-term potential for damage to both terrestrial and aquatic habitats through resource uses such as timber harvest and mineral development.

There would be no significant impacts on the fisheries, or threatened or endangered species in any of the study areas or units since no wildlife facility developments are planned in any of the study units.

The mere designation of a block of land as wilderness does not automatically imply either benefit or detriment to wildlife. A large block of land without vehicle access provides a secure area for wildlife. On the other hand, the lack of vehicle access to large blocks of land often results in the loss of game harvest as a wildlife management tool.

Wildlife (Aquatic)

Grazing Management

Shorelines bare of vegetation are prone to accelerated erosion and allow more sedimentation in reservoirs. Grazing treatments with the spring grazing of crested wheatgrass, mechanical treatments, fencing of reservoirs and construction of new reservoirs would increase shoreline vegetation. Rest rotation would also increase shoreline vegetation (Gyersing, Frank, Journal of Range Management, V. 28, No. 1, January 1975, p.p. 37-42). This is applicable to developed reservoirs.

Mechanical treatments are designed to hold precipitation and increase infiltration (Ryerson, et al., 1980). The effect of holding water in place is to decrease runoff and prevent reservoirs from filling with sediment as rapidly as they would otherwise. Reservoirs with low water levels are much more prone to summer and winter fish kills so snow harvesting should be used in areas where runoff is reduced by mechanical treatments. Mechanical treatments also provide additional vegetation that would improve livestock distribution and could relieve some of the grazing pressure around fishing reservoirs. This would slightly improve the quality of the fisheries.

Additional water sources in pastures with fisheries would more evenly distribute livestock and slightly reduce livestock concentrations around shorelines of the fisheries reservoirs.

Numerous studies have documented the effects of grazing on the aquatic ecosystem (Duff, 1977; Marcuson, 1977; Behnke and Zarn, 1976; Platts, 1978; and Behnke and Raliegh, 1978). Impacts such as sedimentation, changes in channel morphology, nutrient loading and increased water temperature are some of the factors that deteriorate due to livestock grazing on streambanks or reseryoir shorelines.

Wild Horse Management

Keeping the wild horse population in balance with available forage would allow vegetative conditions to improve, watershed conditions to stabilize and reduce the sediment runoff into Crooked Creek and established reservoirs.

Reduced sedimentation would help maintain and protect spawning sites in Crooked Creek. Likewise, streamside vegetation would be maintained or improved helping to stabilize streambanks, provide shade and filter overland flow.

Timber

In the short term, some increased water yields and erosion, resulting in greater sediment yields and organic debris to the associated aquatic resources, could occur. However, as the cutting unit revegetated, a gradual improvement would take place.

Coal

Potential leasing and development by surface mining could cause a short-term local loss of groundwater and/or an increase in the total dissolved solids (TDS) levels. It could also increase short-term erosion, resulting in increased sediment yields to associated aquatic resources such as streams and reservoirs. Before a mining plan can be approved, however, the mining must show how discharges off the mine site are to be controlled under applicable state and Federal laws.

Oil and Gas Leasing

Impacts to the aquatic resources could include increased erosion and sedimentation primarily due to the removal of upland vegetation during road and drill pad construction. Contamination of groundwater resources and degradation of aquatic ecosystems due to spillage could also occur during the drilling operation.

Classifications

Classifications also protect terrestrial habitats and aquatic resources from disturbances associated with mineral entry and development. If the classifications are lifted and mineral development occurs, increased erosion and greater sediment yields deposited in the associated aquatic resources (i.e, reservoirs and streams) could occur due to the loss of upland vegetation and deteriorated watershed conditions.

Recreation Access

With the anticipated gradual decline in vegetative cover along streambanks due to increased human use, degradation of the aquatic resources would gradually occur as erosion and sediment yields increase.

Off-road Vehicle Use

Off-road vehicle use causes the destruction of vegetation and degradation of range condition. Increased erosion would occur as range conditions deteriorate, causing increased sedimentation and decline of the associated aquatic resources.

Recreation

Grazing Management

Vegetative manipulation (sagebrush burning and mechanical treatments) should improve wildlife habitat; increase wildlife populations and improve hunting opportunities.

Constructing range improvements (fences, some water developments) would restrict some recreation access and wildlife movement. Winter, spring and yearlong grazing may deteriorate wildlife habitat. Both would result in a minor decrease in hunting opportunities.

Wild Horse Management

Impacts caused by vegetative manipulation and fencing would be similar to those discussed above. Acquisition of private land within the horse range would provide long-term public access to these areas.

Wildlife Management

Any activities to improve wildlife or aquatic habitat may produce a corresponding increase in wildlife populations and fishing and hunting opportunities. Fence construction would cause similar impacts as those discussed under grazing management.

Timber Management

Selective timber harvest would benefit some wildlife species such as deer and elk by providing an edge effect. Increases in big game numbers could enhance hunting opportunities.

Coal

Overall, the effect would be minimal under the scenarios predicted. People employed by mining would be local hire or commute from larger communities such as Billings. Demand for increased recreational opportunities would be significant.

Oil and Gas Leasing

Exploration operations may affect wildlife habitat and decrease hunting opportunities. Road construction may provide additional recreation access into public lands.

Land Tenure Adjustment

The sale of public land would result in a loss of recreational opportunities associated with that land. Conversely, exchanges or exchange pooling for high quality recreational lands would increase opportunities. This would be particularly true of floating, hunting and fishing opportunities if selective land tracts were acquired through exchange along the major rivers in the resource area.

Classifications

Mineral segregations prevent habitat destruction, thereby benefitting wildlife populations and hunting opportunities.

Recreation Access

Increasing access to public lands would help BLM to meet the local and national demand for recreation lands.

Off-road Vehicle Use

Off-road vehicle designations generally restrict the use of an area, thus concentrating use on available lands.

Wild Horse Interpretation

Interpretation would benefit recreationists who visit the Pryor Mountains by providing information about wild horse management and boundary locations.

Wilderness

Wilderness designation would prohibit off-road vehicle use in the study areas or units. Hunters using vehicles to retrieve game would be especially affected.

The overall effect of closures is limited by the low use these areas received for recreational activities, other than hunting. Hunting and other recreational activities could continue in designated wilderness, but the mode of transportation would have to change from vehicle-based to foot or horseback.

Designation as wilderness would enhance all types of compatible, non-motorized recreation including hiking, walk-in hunting, camping, fishing, sightseeing and other activities.

There would be a benefit to visual resources in areas designated as wilderness since any surface disturbing activities would be limited or not allowed. In areas not recommended for wilderness, visual resources could be adversely impacted by continuing multiple use activities.

Visual Resources

The major factor creating a negative impact to the visual resources in these four alternatives is the extent of surface disturbances in the short term. Long-term impacts would depend on the capability of the disturbed areas to recover from these disturbances. Any developments or grazing systems implemented to stabilize soils and increase vegetation would improve scenic quality.

Table 4.1 displays the average unmitigated impacts of selected developments under each of the four visual resource management classes (VRM I, II, III, IV) in the resource area.

Very few, if any developments are proposed within Class I or II landscapes with the exception of those in the Pryor Mountain Wild Horse Range. To conform with guidelines of these two classes, it's anticipated that any project would create a medium to high impact. This would be especially true if a protective withdrawal was not approved for the Pryor Mountain area and mineral development occurred.

Class III and IV landscapes, such as those on public lands in the north half of the resource area, would be the VRM classes most affected by the majority of the proposed developments. Most impacts are rated low because the projects could be accomplished within the guidelines for these two classes.

Cultural Resources

Cultural evidence is meaningful largely in relation to the degree that the site from which it comes has remained undisturbed. An artifact or feature might be important, but the association or context in which it was found may be equally or much more significant. When sites are disturbed, the opportunity for analysis by the archeologist or historian is lost as is important information about the past.

Constructing range facilities, water developments, mines, roads, drill hole pads and plowing, seeding and scalping can cause significant adverse impacts to a cultural site. This is because the site is altered by ground disturbance, and thus loses its integrity. In addition, disturbance can occur to sites through vandalism, artifact looting, livestock trampling and ORV traffic.

Ground cover can be improved by forage allocation, grazing treatments, chemical treatments, limited ORV access in certain areas, prohibiting road construction and limiting recreational impacts. These activities do not cause significant surface disturbances and should improve the preservation of cultural resources by improving or stabilizing the conditions which maintain a site's integrity. However, no data exists which allows quantification of such a benefit.

Wilderness designation would substantially limit the potential for surface disturbance and help protect undiscovered sites. Road closures would tend to limit the number of people entering an area and removing or damaging a cultural site. Certain educational efforts, undertaken as part of wilderness management, would tend to enhance the appreciation for cultural features and human history. The BLM Wilderness Management Policy provides for recording and monitoring cultural resources. Salvage of cultural sites is allowed, if necessary, to protect the resource.

TABLE 4.1: RELATIVE LEVEL OF IMPACT TO VISUAL CLASS BY PROJECT

Projects	Major Contrasting Elements	Feature Type	Class I	Class II	Class III	Class IV
Wells-Springs-Tanks	Color Form	Structure	H	H	L	L
Pipeline (buried)	Line	Vegetation Landform	M	M	L	L
Reservoirs-Water Catchment	Form Line	Landform Structure	H	H	M	L
Shade Sources (structure)	Form	Structure	H	H	M	L
Oilers-Salt	Form	Structure	H	L	L	L
Fences-Cattle Guards	Line	Structure	H	M	L	L
Vegetative Manipulations	Line Color Texture	Vegetative	H	H	L	L
Mowing	Line Texture	Vegetative	M	L	L	L
Burning	Line Color Texture	Vegetative	H	H	L	L
Spraying	Line Color Texture	Vegetative	H	H	L	L
Fence Line Contrasts	Line Color	Vegetative	H	M	L	L
Roads-Trails	Line	Landform	H	H	M	L

*All impacts are negative and measured at the time of the project.

H—High
M—Moderate
L—Low

Source: 8400 Manual—Recreation Specialist—EIS Team

Wilderness (Areas Recommended for Designation as Wilderness)

Wilderness Opportunities

The need for additional wilderness opportunities for urban dwellers within 5 hours driving time of the four areas in this study is a consideration in their overall suitability for wilderness designation. As summarized in Appendix 3.7, abundant wilderness is available in the three state region. There has been minimal support for additional wilderness by local residents in southcentral Montana and northern Wyoming based on letters and comments received since the inventory began in 1978. Some local groups strongly oppose additional wilderness in the area. There has been support for several of the areas from state and national wilderness advocacy groups that would like additional wilderness protection wherever possible.

Ecosystem Representation

The addition of the BLM study units or areas to the National Wilderness Preservation System (NWPS) would be an advantage to balancing the diversity of the national system, but because of the number of other units pending designation, would not be a major consideration affecting the suitability of any particular study unit.

Wilderness (Areas Not Recommended for Designation as Wilderness)

Any opportunity to expand the size and diversity of the NWPS would be foregone if none of the study areas or units were designated.

Social

Grazing Management

Changes in BLM grazing would impact ranch income and permit values which in turn would have an effect on the social well-being of families who depend on these ranches. Any increases in ranch income would raise the standard of living. The social well-being of small livestock operators has the greatest potential for being impacted since some of these people are currently earning a minimum income and any change could have an effect on their standard of living.

Coal

The social impacts from coal development are based on population information provided by the E/D model (see Economics, General Impacts) and the Guide to Social Assessment, developed by Mountain West, Inc. This document is on file at the Montana State BLM Office, 222 N. 32nd Street, Billings, Montana. See Appendix 4.8 for a further explanation of the social methodology.

Attitudes

None of the alternatives would change the general attitudes or values presently held by the residents of the Billings Resource Area but they could affect attitudes toward and expectations of BLM and the Federal Government in general. Some issues addressed in these alternatives could elicit reactions from individuals or groups affected by the proposals.

Economics

Grazing Management

This section analyzes the direct effects of increases and decreases in grazing on ranch income and permit values in the EIS area. The economic impact on ranch income caused by changes in grazing for the four representative ranch types (see Ranch Related Economics, Chapter 3) was determined through a linear programming model (see Appendix 3.9). All income information is calculated from these average budgets. Although the term "representative ranch" is used, the region has no real representative ranch. Each operation is unique. The impact on individual ranch incomes varies by the dependency on BLM grazing, the amount of the change in BLM grazing, the size of the operation, the way the operator would adjust the ranch operation to changes in grazing and the amount of cash crops raised. Changes in income are calculated on the assumption that ranch operators would adjust herd sizes in response to changes in AUMs. However, some operators might prefer to extend their grazing season to use additional AUMs. Other individuals might elect to feed cattle in response to decreases. In these cases, herd size would not change.

The impact on ranch income is measured only by the change in the number of BLM AUMs. Economic benefits can also be produced by such qualitative changes as improved range condition and water distribution (Kothmann, 1970). Benefits can include heavier calves, increased calf crops and possibly even reduced death losses. It is entirely possible that a ranch operator, even though he reduces the size of his herd, may end up selling more pounds of beef in the fall because of these economic factors.

Grazing systems would increase the cost to ranch operations through increased fence maintenance, increased efforts in monitoring forage conditions and more movement of livestock. These costs are included in the ranch budget models (see Appendix 3.9).

Adjustments in BLM grazing would affect the total value of BLM grazing permits. The market value of the BLM permit is presently estimated to be $100 per AUM (see Ranch Related Economics, Chapter 3) and a change would cause a loss or gain in the capital position (wealth) of affected ranches. This change would be realized as cash only if the ranch or a portion of the ranch is sold, transferred or used as collateral for a loan.

Coal

The potential exists for increased coal leasing and development in the Low, High and Preferred Level Management Alternatives. The BLM Economic and Demographic model was used to assess the impacts of coal development within the Billings Resource Area. Appendix 4.1 provides further explanation of the E/D model and the economic analysis conducted. Impacts from coal development are discussed in the economic impacts for the alternatives.

Oil and Gas

With the potential for oil and gas or locatable mineral discovery being extremely low and with little interest in exploration, there would likely be no significant impacts to the economy of the resource area. In 1980 less than 2% of the labor force in the resource area was employed in oil and gas extraction (County Business Patterns, 1980).